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EXPERIMENTS COMPARING CONSTANT TEMPERATURE METHODS OF ROASTING BEEF AND LAMB WITH THE STANDARD METHODS

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The standard methods of roasting beef ribs, leg of lamb, leg and loin of veal and pork for palatability tests include very high oven temperatures at the start for short quick searing, followed by slow to moderate temperature for the finish of the cooking. Several members of the committee on cooking methods have proposed to change to constant temperature methods of roasting, without the initial sear. At the 1932 annual conference the members of the committee discussed the effects of initial searing as indicated by experimental data, and voted to accumulate further evidence in order to determine what constant oven temperature would cook meat as uniformly as the present standard methods do, without modifying its palatability or changing the amount of shrinkage. The appearance of the meat when cooked, the time required, and the amount of fuel consumed were also to be considered for each method. As a continuation of experiments reported to the annual conference in 1932, the following series on beef and lamb were carried out.

Experimental Procedure

Beef- Thirty pairs of beef ribs of different grades were roasted to the same rare stage and tested for palatability. The left cuts were roasted by the standard method (seared 20 minutes at 265°C., then cooked at 125°C. until the meat temperature is 58°C.), and the corresponding right cuts were roasted at three different constant oven temperatures without searing. Ten pairs each were used to compare 125°, 150°, and 175°C. with the standard method. The data for shrinkage are given in figure 1 and for palatability and resistance to shearing in tables 1, 2, and 3.

Lamb- Thirty pairs of lamb legs of different grades were roasted to the same medium-to-well-done stage (76°C.) and tested for palatability. The left legs were roasted by the standard method (seared 20 minutes at 265°C., finished at 125°C.) and the corresponding right legs were roasted at three different constant oven temperatures without searing. Ten pairs each were used to compare 125°, 150°, and 175°C. with the standard method. The data for shrinkage are shown in figure 2 and for palatability and resistance to shearing in tables 4, 5, and 6.

Summary of Results

Appearance- The higher the constant oven temperature the better was the appearance of the beef and lamb roasts. For beef either 150° or 175°C. usually produced roasts equal in appearance to the standard method. At the same time no one of these methods, the standard included, produced beef roasts of really appetizing well-browned appearance unless they were large, fine quality cuts of meat to begin with. At either 125° or 150°C. constant oven temperature lamb was not at all appetizing in appearance. At 175°C. lamb was usually as well browned as when the standard method was used but the muscles were rather shrunken around the bone ends.

Uniformity of cooking- The only basis of judging the uniformity of cooking in these tests was the pink color of the rare beef when carved. At the center of the three rib roasts where judges' samples are taken out there was no visible evidence that the uniformity of cooking was greatly different for duplicate roasts cooked at constant 125°, 150°, or 175°C., in comparison respectively with the standard method. There was no way of judging the uniformity of cooking lamb because it was too nearly well-done to show much variation in color.

Palatability- The judges' scores for beef roasted by the different constant temperature methods in comparison with the standard indicate that the desirability of the flavor of fat was somewhat lower at constant 125°C. At the higher constant oven temperatures of 150° and 175° C. there was no consistent difference in this factor, although there were several cases strongly in favor of the standard method. None of the other factors of palatability appeared to be definitely affected by the oven temperature in the case of beef.

For lamb, the oven temperature appeared to influence slightly several of the palatability factors. There were indications that the desirability of the aroma was less when the roasting was done at the constant oven temperatures than by the standard method. In seven cases out of ten the desirability of the flavor of fat was less for lamb cooked at 150°C. than by the standard method. The quantity of juice was less in most cases at 150° and at 175°C. constant oven temperature. According to judges' scores lamb was less tender when roasted at constant 150°C. than by the standard. This result is corroborated by experiments previously reported comparing 125° and 150°C. as oven temperatures for finishing leg of lamb after it has been seared. Sixteen out of twenty pairs showed that lamb was less tender when 150°C. was used. In the present tests the resistance to shearing, which is an objective test for tenderness, also indicates that lamb was less tender at 150°C. than when roasted by the standard method. In contrast, constant temperatures of either 125°C. or 175°C. when compared with the standard method did not appear to affect the tenderness of lamb.

In connection with the different results obtained for beef and for lamb it is noted that beef is cooked only to the rare stage, whereas lamb is cooked almost well-done, and further that the samples which the judges taste come from the center of 3-rib roasts of beef but from a lamb muscle lying near the outer surface of the leg. It is therefore quite possible that oven temperature affects lamb more than beef under the present system of cooking and judging the samples for palatability.

Shrinkage- For both beef and lamb the shrinkage was not significantly different when constant 150°C. was compared with the standard method of roasting. At 125°C. for both beef and lamb shrinkage was lower than by the standard method, and at 175°C. it was higher. Incidentally these results show that average oven temperature has more influence on shrinkage than does the fact that meat is seared or left unseared in the beginning.

Time required for cooking- For both beef and lamb the length of time required for cooking was longer at constant 125°C. than when the standard method was used and shorter when either 150° or 175°C. constant oven temperatures were used.

Fuel consumed- The constant oven temperatures of 125°, 150°, and 175°C. required less gas than the standard method in all cases where it was possible to collect data. For beef the gas consumed was, respecitvely, 25% less at 150°C. and 16% less at 175°C. than when the standard method was used. For lamb the following reductions in fuel consumption were found as compared with the standard method: 125°C., 29%; 150°C., 22%; and 175°C., 22%.

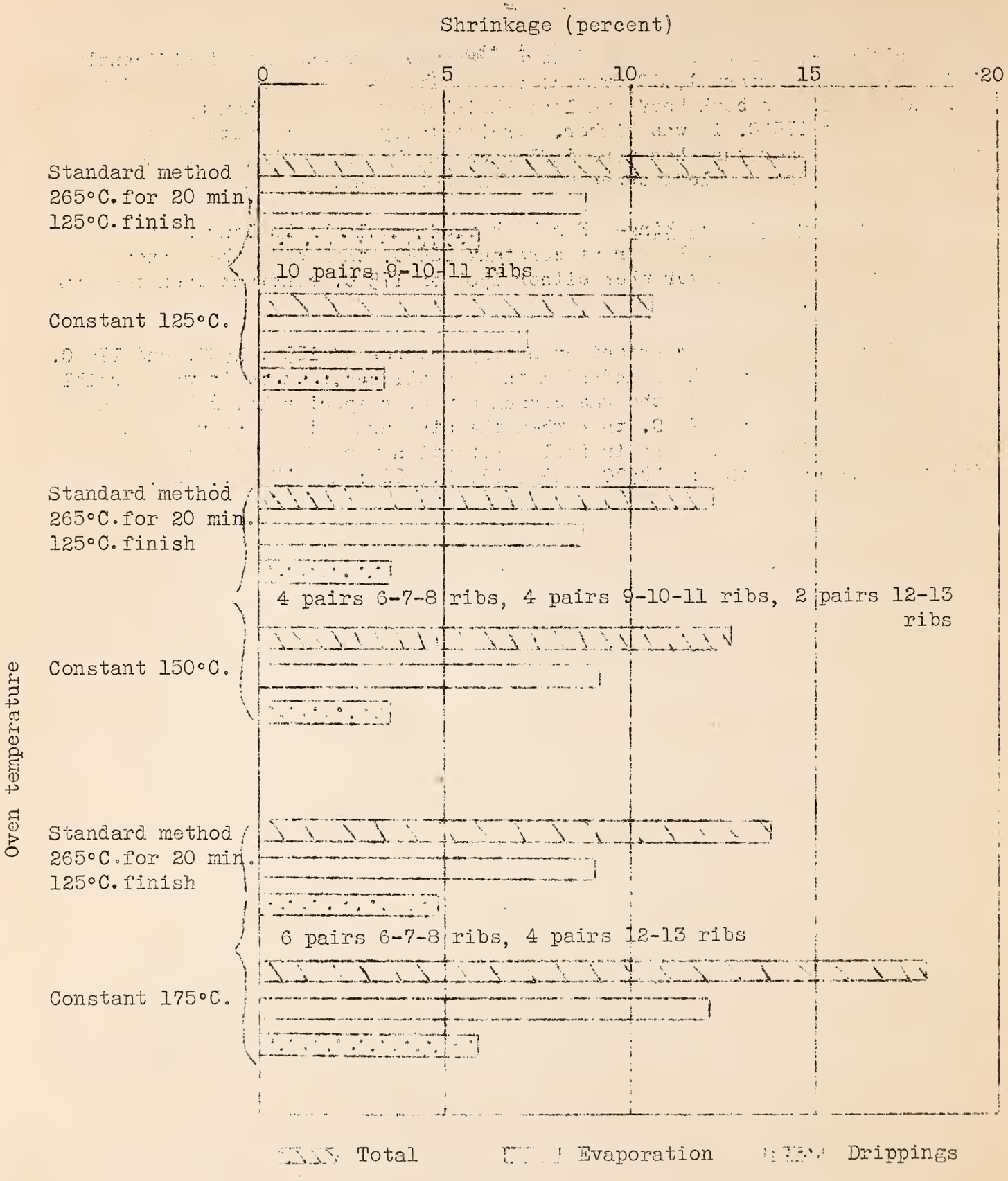

Figure 1. Shrinkage, or cooking losses, of rib roasts of beef, rare (58°C.). Comparison of standard method with constant temperature roasting.

Table 1. Comparison of palatability scores and resistance to shearing of paired beef ribs of different grades roasted by the standard method and at a constant 125°C.

Method of roasting	Grade and cut of beef	Roast no.	Palatability scores: Aroma Intensity	Aroma Desirability	Texture	Flavor of fat Intensity	Flavor of fat Desirability	Flavor of lean Intensity	Flavor of lean Desirability	Tenderness	Juiciness Qual.	Juiciness Quan.	Resistance to shearing, pounds
Standard	Choice	1 L	3.8	4.4	4.8	3.4	4.4	4.8	4.8	4.8	4.8	5.0	18.5
Constant 125°C.	9-10-11	1 R	3.4	3.8	5.0	3.8	4.6	4.8	5.2	5.6	4.6	5.2	23.9
Standard	Choice	2 L	4.6	5.8	5.2	4.0	6.2	5.2	6.2	5.8	4.8	5.6	25.4
Constant 125°C.	9-10-11	2 R	4.4	5.6	5.2	3.4	5.0	5.0	5.8	5.8	5.2	5.4	24.3
Standard	Good	3 L	4.2	3.6	4.6	4.0	4.8	4.4	4.8	6.0	4.4	5.6	21.1
Constant 125°C.	9-10-11	3 R	4.2	4.4	4.3	3.8	3.8	4.6	4.0	5.8	4.0	5.2	22.3
Standard	Good	4 L	5.0	4.6	5.4	4.0	5.4	4.6	5.4	4.8	4.8	5.2	34.6
Constant 125°C.	9-10-11	4 R	4.6	5.4	4.4	4.2	4.8	4.8	5.4	5.6	4.8	5.8	32.9
Standard	Good	5 L	5.2	4.8	5.4	4.6	5.2	4.4	5.4	5.6	4.8	5.2	29.1
Constant 125°C.	9-10-11	5 R	4.8	5.2	5.4	4.4	5.2	5.0	5.6	5.6	5.2	5.4	26.6
Standard	Medium	6 L	4.2	4.8	5.0	3.8	4.6	4.2	5.0	5.4	4.4	4.6	24.9
Constant 125°C.	9-10-11	6 R	4.2	4.4	5.6	4.0	4.2	4.4	5.4	5.6	4.8	5.2	27.3
Standard	Medium	7 L	4.2	3.8	4.4	3.4	4.4	4.6	5.0	5.8	4.8	4.6	25.9
Constant 125°C.	9-10-11	7 R	4.0	4.8	5.0	3.0	3.8	4.4	5.2	5.2	4.4	4.6	27.8
Standard	Medium	8 L	4.6	5.0	4.8	3.8	5.4	4.8	5.4	5.0	4.4	5.4	33.0
Constant 125°C.	9-10-11	8 R	5.6	4.8	4.6	3.8	5.0	5.0	5.4	5.0	4.6	5.2	32.4
Standard	Common	9 L	4.0	4.4	4.6	3.8	3.8	4.0	4.4	4.8	3.6	4.6	28.1
Constant 125°C.	9-10-11	9 R	4.4	4.4	4.8	3.4	3.2	4.6	4.4	4.8	4.0	5.0	23.8
Standard	Common	10 L	5.0	5.0	4.2	3.8	5.0	4.4	5.0	5.2	4.6	5.4	23.1
Constant 125°C.	9-10-11	10 R	4.6	4.8	4.8	4.0	4.8	4.4	5.2	4.6	4.2	5.0	25.6
Average Standard			4.5	4.6	4.8	3.9	4.9	4.5	5.1	5.3	4.5	5.1	26.4
Average Constant 125°C.			4.4	4.8	4.9	3.8	4.4	4.7	5.2	5.4	4.6	5.2	26.7

Table 2. Comparison of palatability scores and resistance to shearing of paired beef ribs of different grades roasted by the standard method and at a constant 150°C.

Method of roasting	Grade and cut of beef	Roast no.	Palatability scores: Aroma Intensity	Aroma Desirability	Texture	Flavor of fat Intensity	Flavor of fat Desirability	Flavor of lean Intensity	Flavor of lean Desirability	Tenderness	Juiciness Qual.	Juiciness Quan.	Resistance to shearing, pounds
Standard	Low choice	1 L	4.4	4.8	5.0	3.6	5.6	4.2	5.4	5.8	4.6	5.0	27.3
Constant 150°C.	6-7-8	1 R	4.4	5.0	5.0	3.6	5.2	4.4	5.6	5.8	4.4	5.2	25.8
Standard	Low choice	2 L	4.2	3.8	5.2	3.8	4.8	4.4	5.0	5.8	4.2	5.2	20.0
Constant 150°C.	9-10-11	2 R	4.6	4.6	5.2	4.4	5.4	5.2	5.6	5.8	4.6	5.0	19.2
Standard	Good	3 L	4.4	4.6	4.8	3.4	4.8	4.4	5.0	5.2	4.0	4.6	29.9
Constant 150°C.	6-7-8	3 R	4.4	4.8	5.0	3.4	4.8	4.6	5.6	5.0	4.4	4.6	36.1
Standard	Good	4 L	4.6	4.8	5.2	4.0	5.0	4.6	5.0	3.6	4.2	4.6	38.0
Constant 150°C.	9-10-11	4 R	4.8	4.8	4.8	4.2	4.8	4.6	4.8	3.8	3.8	4.2	37.3
Standard	Good	5 L	4.6	4.4	4.8	3.6	4.8	4.6	4.6	4.0	3.8	4.3	27.1
Constant 150°C.	12-13	5 R	4.8	4.8	5.0	4.6	4.6	4.6	5.0	4.6	4.2	4.6	31.2
Standard	Medium	6 L	4.4	4.6	4.8	4.2	5.6	4.8	5.0	5.8	4.8	5.2	23.1
Constant 150°C.	6-7-8	6 R	4.6	4.2	5.2	3.4	4.8	5.0	5.4	5.8	4.8	5.0	28.5
Standard	Medium	7 L	4.4	4.6	5.2	4.0	5.0	5.4	5.4	5.6	4.6	4.8	23.5
Constant 150°C.	9-10-11	7 R	4.6	5.0	4.8	3.8	5.2	5.2	4.6	5.2	3.8	4.8	21.3
Standard	Common	8 L	4.8	3.4	4.6	3.6	4.4	4.0	4.4	5.0	4.0	5.2	31.3
Constant 150°C.	6-7-8	8 R	4.6	3.8	4.8	4.0	4.0	4.4	4.8	4.5	4.6	5.2	28.3
Standard	Common	9 L	4.2	4.0	5.0	4.2	4.8	5.0	5.2	4.6	4.8	5.5	26.5
Constant 150°C.	9-10-11	9 R	4.2	4.0	5.0	4.4	4.2	4.4	4.6	5.0	4.0	5.4	29.8
Standard	Common	10 L	4.6	4.0	4.8	4.6	4.2	4.6	5.0	5.8	4.8	5.2	22.8
Constant 150°C.	12-13	10 R	4.6	4.4	5.0	4.4	4.2	4.4	4.8	5.2	4.2	5.2	23.8
Average Standard			4.5	4.3	4.9	3.9	4.9	4.6	5.0	5.1	4.4	5.0	27.0
Average Constant 150°C.			4.6	4.5	5.0	4.0	4.7	4.7	5.1	5.1	4.3	4.9	28.1

Table 3. Comparison of palatability scores and resistance to shearing of paired beef ribs of different grades roasted by the standard method and at a constant 175°C.

Method of roasting	Grade and cut of beef	Roast no.	Palatability scores: Aroma			Flavor of fat		Flavor of lean			Juiciness		Resistance to shearing, pounds
			Intensity	Desirability	Texture	Intensity	Desirability	Intensity	Desirability	Tenderness	Qual.	Quan.	
Standard	Choice	1 R	4.4	5.2	5.0	3.8	5.6	4.6	4.2	6.0	4.2	5.0	20.8
Constant 175°C.	6-7-8	1 L	4.4	4.6	4.2	3.4	3.8	4.8	3.6	5.6	3.8	4.8	23.9
Standard	Good	2 R	4.2	5.0	5.6	4.0	5.2	4.8	5.6	6.0	4.6	5.2	45.0
Constant 175°C.	6-7-8	2 L	4.6	4.6	5.4	4.2	4.2	4.2	5.0	5.4	4.0	5.2	35.5
Standard	Good	3 L	4.6	5.2	4.8	3.0	4.0	4.0	4.6	5.6	4.2	6.6	25.0
Constant 175°C.	6-7-8	3 R	4.6	4.4	4.6	3.2	4.8	4.6	4.8	5.6	5.2	6.2	24.4
Standard	Good	4 L	5.0	5.4	4.8	4.6	5.8	4.4	5.6	5.6	5.2	6.4	16.3
Constant 175°C.	12-13	4 R	4.2	4.2	5.0	4.0	4.2	4.4	5.2	6.8	5.4	7.0	15.9
Standard	Low good	5 L	5.0	4.3	4.8	3.3	4.5	4.8	5.3	6.0	5.0	6.0	26.8
Constant 175°C.	6-7-8	5 R	4.8	5.5	5.3	3.3	4.8	4.0	5.0	5.8	5.0	6.0	24.8
Standard	Low good	6 L	5.0	3.5	4.8	3.8	4.3	4.3	4.8	6.0	4.8	5.5	21.3
Constant 175°C.	12-13	6 R	5.0	5.3	4.5	3.5	4.5	4.3	4.8	6.3	5.0	6.0	19.8
Standard	Medium	7 R	4.4	4.8	4.6	3.6	4.8	5.0	5.2	5.6	4.4	5.0	33.6
Constant 175°C.	6-7-8	7 L	4.8	5.2	5.2	4.8	3.0	4.2	3.2	4.6	3.2	4.4	37.8
Standard	Medium	8 L	4.2	4.4	4.4	5.4	4.8	5.0	5.4	5.2	4.6	5.4	26.1
Constant 175°C.	12-13	8 R	3.6	4.6	5.2	4.2	5.0	4.8	5.0	4.2	4.2	5.4	46.3
Standard	Common	9 L	4.8	4.4	4.2	4.0	4.0	4.0	4.0	4.8	4.4	5.6	33.9
Constant 175°C.	6-7-8	9 R	4.2	4.0	4.2	4.2	3.8	4.2	4.6	4.4	4.2	5.6	33.9
Standard	Common	10 L	4.0	4.6	4.8	4.0	4.6	4.2	4.6	5.4	4.4	6.0	24.5
Constant 175°C.	12-13	10 R	4.2	4.6	4.6	4.0	4.0	4.4	5.0	5.0	4.4	5.6	26.9
Average Standard			4.6	4.7	4.8	4.0	4.8	4.5	4.9	5.6	4.6	5.7	27.3
Average Constant 175°C.			4.4	4.7	4.8	3.9	4.2	4.4	4.6	5.4	4.4	5.6	28.9

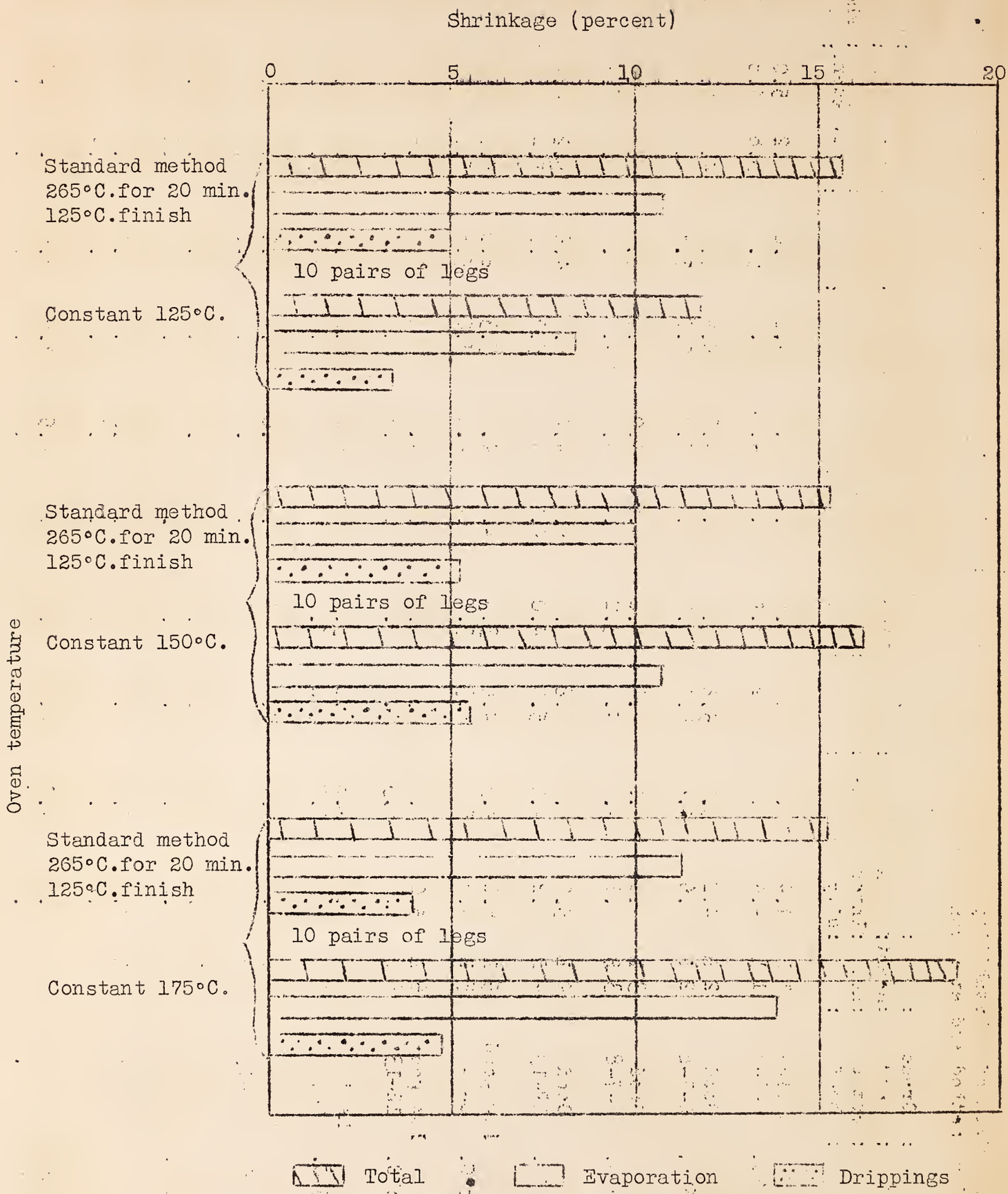

Figure 2. Shrinkage, or cooking losses, of leg of lamb. Comparison of standard method with constant temperature roasting.

Table 4. Comparison of palatability scores and resistance to shearing of paired lamb legs of different grades roasted by the standard method and at a constant 125°C.

Method of roasting	Grade of lamb	Roast no.	Palatability scores: Aroma: Intensity	Aroma: Desirability	Texture	Flavor of fat: Intensity	Flavor of fat: Desirability	Flavor of lean: Intensity	Flavor of lean: Desirability	Tenderness	Juiciness: Qual.	Juiciness: Quan.	Resistance to shearing, pounds
Standard		1 L	5.2	4.8	4.6	4.0	5.0	4.8	5.4	5.8	4.4	4.8	16.9
Constant 125°C.	High good	1 R	5.0	4.6	4.6	4.4	5.4	4.8	5.0	5.4	4.5	5.3	26.5
Standard		2 L	5.4	5.4	4.6	4.2	4.8	4.8	4.8	4.6	4.4	5.8	20.8
Constant 125°C.	High good	2 R	5.6	3.0	4.0	4.4	3.8	5.0	4.2	4.4	4.2	4.8	35.3
Standard		3 L	5.2	5.0	4.2	4.2	5.0	5.2	5.2	5.8	4.4	4.8	17.6
Constant 125°C.	High good	3 R	5.0	6.2	5.0	4.6	5.4	4.6	5.8	5.6	4.6	4.4	18.6
Standard		4 L	4.6	5.8	4.8	4.6	5.0	4.6	5.0	5.2	4.8	4.8	20.1
Constand 125°C.	Good	4 R	4.8	5.6	4.2	4.6	4.6	4.8	5.2	4.8	4.8	4.8	21.5
Standard		5 L	4.8	4.6	4.8	4.6	4.8	4.6	4.6	4.6	4.0	3.8	---
Constant 125°C.	Good	5 R	5.2	4.4	4.4	4.8	4.0	4.8	5.0	5.2	4.6	3.8	---
Standard		6 L	5.4	4.6	4.6	4.2	4.4	5.2	4.8	4.4	3.8	3.8	27.9
Constant 125°C.	Low good	6 R	5.2	4.2	4.6	4.0	4.2	5.0	4.2	4.6	3.6	4.0	23.8
Standard		7 L	4.8	6.0	4.8	4.4	5.0	5.6	5.8	4.8	4.6	4.6	24.5
Constant 125°C.	Low good	7 R	5.4	5.8	5.4	4.2	5.6	5.2	5.8	5.2	4.8	4.8	23.5
Standard		8 L	5.4	5.0	4.4	5.0	4.6	5.2	5.2	5.0	4.8	4.0	28.4
Constant 125°C.	Low good	8 R	5.4	4.8	4.6	4.8	4.0	5.0	5.4	5.8	4.2	4.2	19.0
Standard		9 L	4.2	5.4	4.8	3.8	5.4	4.6	5.0	4.8	4.2	5.4	26.5
Constant 125°C.	Medium	9 R	4.6	4.2	5.0	4.8	4.0	4.6	4.0	4.0	4.0	5.0	34.0
Standard		10 L	4.8	3.8	4.4	4.4	4.0	4.4	4.4	4.4	4.2	4.4	23.9
Constant 125°C.	Medium	10 R	4.6	5.0	4.4	4.4	4.8	4.4	4.8	5.2	4.2	4.8	23.4
Average Standard			5.0	5.0	4.6	4.3	4.8	4.9	5.0	4.9	4.4	4.6	23.0
Average Constant 125° C.			5.1	4.8	4.6	4.5	4.6	4.8	4.9	5.0	4.4	4.6	25.1

Table 5. Comparison of palatability scores and resistance to shearing of paired lamb legs of different grades roasted by the standard method and at a constant 150° C.

Method of roasting	Grade of lamb	Roast no.	Palatability scores: Aroma: Intensity	Aroma: Desirability	Texture	Flavor of fat: Intensity	Flavor of fat: Desirability	Flavor of lean: Intensity	Flavor of lean: Desirability	Tenderness	Juiciness: Qual.	Juiciness: Quan.	Resistance to shearing, pounds
Standard		1 L	4.6	5.0	4.4	4.2	5.2	5.0	5.6	5.6	4.8	4.8	18.8
Constant 150°C.	Choice	1 R	4.6	5.2	4.6	4.0	5.0	5.0	5.2	5.0	4.4	4.0	24.8
Standard		2 L	4.4	5.4	5.0	3.8	5.4	5.0	4.8	4.8	4.6	5.2	29.1
Constant 150°C.	Low Choice	2 R	4.0	5.0	4.6	3.6	5.0	4.6	4.2	4.0	4.4	4.4	34.5
Standard		3 L	5.0	4.2	5.4	4.2	4.6	4.6	4.4	3.6	4.2	4.2	34.8
Constant 150°C.	Low Choice	3 R	4.8	5.2	4.8	4.2	4.4	4.4	4.6	3.4	4.0	4.2	31.8
Standard		4 L	4.8	4.0	5.4	3.8	4.4	5.4	3.8	4.8	4.2	4.8	20.1
Constant 150°C.	Low Choice	4 R	4.8	4.4	5.2	4.6	4.8	5.2	4.2	5.2	4.4	4.6	24.6
Standard		5 L	4.6	5.4	4.8	4.2	5.2	5.0	5.0	4.8	4.4	4.2	24.8
Constant 150°C.	High Good	5 R	4.8	5.4	4.6	3.8	5.0	4.8	4.8	4.6	4.2	4.2	29.0
Standard		6 L	5.4	5.4	5.2	4.6	5.0	5.0	4.8	5.0	4.4	4.4	22.5
Constant 150°C.	High Good	6 R	5.4	3.0	5.2	4.6	3.6	5.6	3.4	4.6	4.2	3.8	24.4
Standard		7 L	4.4	5.0	5.2	3.8	4.8	4.8	5.0	5.0	4.6	4.6	22.5
Constant 150°C.	Good	7 R	4.6	4.2	5.2	4.4	5.0	4.8	5.0	5.0	4.6	4.6	26.1
Standard		8 L	5.2	4.8	5.4	4.0	5.0	4.8	4.6	4.6	4.4	4.2	25.4
Constant 150°C.	Good	8 R	4.8	5.0	5.6	4.0	4.8	4.8	3.8	4.8	4.0	4.2	29.9
Standard		9 L	4.6	4.8	4.5	4.6	4.8	4.6	5.0	4.4	4.2	4.0	30.3
Constant 150°C.	Low good	9 R	5.0	4.4	5.2	4.6	4.8	4.8	5.2	3.6	4.0	3.8	39.9
Standard		10 L	4.6	4.8	5.4	4.4	5.2	4.8	4.6	4.0	4.4	4.6	29.8
Constant 150°C.	Common	10 R	4.8	4.6	5.4	4.8	5.0	5.0	4.4	3.4	4.0	4.0	42.3
Average Standard			4.8	4.9	5.1	4.2	5.0	4.9	4.8	4.7	4.4	4.5	25.8
Average Constant 150°C.			4.8	4.6	5.0	4.3	4.7	4.7	4.5	4.4	4.2	4.2	30.7

Table 6. Comparison of palatability scores and resistance to shearing of paired lamb legs of different grades roasted by the standard method and at a constant 175°C.

Method of roasting	Grade of lamb	Roast no.	Palatability scores: Aroma Intensity	Aroma Desirability	Texture	Flavor of fat Intensity	Flavor of fat Desirability	Flavor of lean Intensity	Flavor of lean Desirability	Tenderness	Juiciness Qual.	Juiciness Quan.	Resistance to shearing, pounds
Standard		1 L	5.4	4.0	5.0	4.0	4.0	5.2	4.2	4.8	4.2	4.0	24.5
Constant 175°C.	Choice	1 R	5.2	5.8	5.2	4.0	4.4	4.8	5.0	4.4	4.4	3.8	28.6
Standard		2 L	5.6	5.4	5.0	4.2	4.0	5.0	4.4	5.6	4.8	5.0	32.9
Constant 175°C.	Good	2 R	5.2	5.8	5.0	4.6	4.8	5.2	5.0	5.0	4.4	4.2	26.0
Standard		3 L	4.8	5.6	5.2	4.0	5.4	4.8	5.8	5.8	4.6	4.4	21.8
Constant 175°C.	Good	3 R	5.4	4.2	4.8	3.6	4.8	5.3	4.8	5.0	4.2	4.2	18.9
Standard		4 L	4.8	4.4	5.0	3.4	4.2	4.4	4.8	4.8	4.0	4.2	17.0
Constant 175°C.	Low Good	4 R	5.0	4.2	5.3	3.4	3.8	4.4	4.6	5.4	4.4	4.0	18.1
Standard		5 L	4.8	4.2	4.6	3.2	4.0	4.4	4.2	4.8	4.2	4.4	17.3
Constant 175°C.	High Medium	5 R	5.2	5.4	4.8	3.2	3.6	4.8	4.6	5.4	4.0	3.6	19.0
Standard		6 L	4.8	5.0	5.0	3.6	4.4	4.6	4.0	4.6	4.2	4.6	19.1
Constant 175°C.	Medium	6 R	5.2	4.2	5.2	3.2	4.2	4.2	4.6	5.4	4.4	3.8	18.8
Standard		7 L	4.8	3.8	4.8	3.0	3.6	4.6	2.8	3.6	3.8	4.6	26.5
Constant 175°C.	Common	7 R	5.2	2.2	5.6	3.0	3.6	4.2	2.8	3.5	3.2	4.2	26.8
Standard		8 L	5.0	4.6	5.2	4.0	4.4	4.6	4.2	2.2	3.2	2.8	36.1
Constant 175°C.	Common	8 R	5.0	5.4	5.2	4.0	4.6	5.2	4.4	3.0	3.4	3.2	33.5
Standard		9 L	4.6	4.6	5.0	3.6	4.0	4.2	3.6	4.6	3.8	4.4	18.1
Constant 175°C.	Common	9 R	5.4	2.2	5.5	3.4	3.4	4.4	3.2	5.2	4.2	4.6	20.8
Standard		10 L	4.6	4.4	5.2	3.4	3.6	4.6	3.4	4.0	3.8	4.2	27.9
Constant 175°C.	Cull	10 R	5.4	2.6	5.2	3.2	3.8	4.0	3.0	3.0	3.5	4.0	30.1
Average Standard			4.9	4.6	5.0	3.6	4.2	4.6	4.1	4.5	4.1	4.3	24.1
Average Constant 175°C.			5.2	4.2	5.2	3.6	4.1	4.7	4.2	4.5	4.0	4.0	24.1